OFFICE MEMORANDUM

DATE: December 10, 1997

TO: Regional Engineers
Regional Associate Delivery Engineers
TSC Managers
Resident/Project Engineers
Regional Materials Engineers
Regional Materials Supervisors

FROM: Gary D. Taylor
Chief Engineer/Deputy Director
Bureau of Highway Technical Services

C. Thomas Maki
Deputy Director
Bureau of Highway Operations

SUBJECT: **Joint Bureau of Highway Instructional Memorandum 1997-C-S**
Interim Procedures for Inspection/Acceptance of Sign Contracts
(Supersedes Joint Construction, Maintenance, Traffic and Safety, and Materials and Technology Instructional Memorandum 1997-C and Construction Instructional Memorandum 1993-6)

This memorandum is to update the process of inspection/acceptance of signing projects. This process continues to evolve to improve the quality of the Department's signs. The Department is partnering with industry to develop an industry driven Quality Assurance Program in the area of signing contracts. It is anticipated this program will include new QC/QA type specifications that will include bonus and penalty provisions. Contractors and fabricators will have the major role in quality control in the production and documentation of their work. The Department will be responsible for all aspects of quality assurance. While these specifications are being developed, some interim procedures will be used.

Two Special Provisions for Traffic Signs have been approved for inclusion in contracts with permanent signs (copies attached). These special provisions will be used as interim specifications until the QC/QA sign specification is completed. They modify the sign requirements of the 1990 and 1996 Standard Specifications for Construction. In addition , the Joint Construction and Materials and Technology Informational Memorandum 1997-B was issued January 10, 1997, which revised the testing and documentation procedures for aluminum sheet used in the fabrication of the Type III and IV signs.

Joint Construction and Materials and Technology Instructional Memorandum 1995-H (8-29-95) and Construction Circular Letter 1995-3 (6-16-95) remain in effect except that all references to CIM 1993-6 should be deleted and replaced with this document.

The following procedures shall be used for all sign contracts:

1.) The Maintenance Division Overhead Sign Shop Supervisor (OSSS) Don Murray (517) 322-3354 shall be notified of all preconstruction meetings scheduled for signing contracts. Notification shall be given as early as possible with the OSSS being placed on the notification mailing list. The OSSS or their representative will discuss possible contract revisions, project reviews, and other information pertaining to the contract.

2.) A special light source is available from the OSSS to assist the inspector in the inspection of permanent signs. Attached is the operating procedure for use of the special light source titled, "Daytime Inspection of Reflective Signs to Determine Uniform Appearance." These procedures have been reviewed with Industry.

3.) Resident/Project Engineers will be responsible for all construction engineering activities for all types of signing contracts. Detailed daily inspection and documentation activities shall be performed by technicians assigned to the Resident/Project Engineer as the contract work progresses. It is important to identify problems early in the contract so they can be dealt with in a timely manner.

4.) Maintenance Division will assist the Resident/Project Engineer as a resource area for technical expertise and training. It is strongly recommended that the Resident/Project Engineer contact the OSSS to review the contractor's progress early in each stage of the contract. During the reviews the OSSS will advise the Resident/Project Engineer of areas of concern on all aspects of the contractor's work. The OSSS will assist in training field personnel in areas of need. All actions taken by the OSSS or their representative, related to an active contract, will be coordinated through the Resident/Project Engineer. It is recommended the Resident Engineer enlist the services of the OSSS as often as needs dictate, especially for overhead sign contracts. The Resident/Project Engineer or their representative shall review the completed project with the OSSS before the punch list is prepared.

5.) Final Inspection for acceptance of sign contracts shall be conducted by the Regional Associate Delivery/Field Engineer or their representative. Final Inspection will be done on a small random sample to assure that the project is in substantial conformance with the plans and specifications.

6.) The Resident/Project Engineer will draft a single Punch List for the contractor's action for acceptance of the project.

These procedures will take effect immediately.

_____

Chief Engineer/Deputy Director
Bureau of Highway Technical Services

_____

Deputy Director
Bureau of Highway Operations

BOHTS:C&T:JG:jp
Subject Index: Inspection
Attachments

cc: Lansing Construction & Technology Division Engineers
Lansing Construction & Technology Division Technicians

Design Division	R. Knapp
Maintenance Division	R. Beckon
OEO	P. Rang
M. Frierson	L. Galehouse
G. Taylor	M. VanPortFleet
T. Maki	J. Reincke
ATSSA	
MRBA	
MAPA	
MCPA	
MCA	
MAA	
AUC	
FHWA	

DAYTIME INSPECTION OF REFLECTIVE SIGNS TO DETERMINE UNIFORM APPEARANCE

1. Scope

1.1 This procedure is intended to provide guidance on the inspection of traffic signs under artificial light during daylight hours to determine if the reflective sheeting exhibits a uniform appearance.

1.2 This visual evaluation of the reflective portion of the sign face is only one aspect of the overall sign inspection and no sign shall be rejected based only on this daytime inspection under artificial light.

2. Significance

2.1 The inspection under artificial light is intended to determine uniformity of appearance and is not intended to measure the amount of reflectivity.

2.2 If an area on the face of a reflectorized sign appears dark when viewed under the specified conditions further evaluation of the sign is required to determine the cause and extent of non-uniformity, and the recommended action.

3. Equipment

3.1 The light source to be used is a one million candela spotlight (Brinkman Q-Beam Max Million spotlight, Model # 800-2500-0, or equivalent approved by the Lansing Maintenance Division). The Maintenance Division has a supply of these spotlights and will provide them to the Project Engineer upon request.

4. Procedure

4.1 Initial inspection using the spotlight is to be conducted by project staff within five working days after installation.

4.2 Signs are to be viewed from the shoulder of the roadway at a distance of not more that 200 feet (60 meters) from the sign.

4.3 The light is to be projected toward the sign with the spotlight at eye level and with a horizontal offset of not more than 2 feet (600 mm) from the viewer's direct line of sight.

4.4 From this distance, it will be necessary to scan the spotlight over the face of large roadside and overhead signs. The entire face of small roadside signs will be illuminated without the need to move the spotlight.

4.5 The inspector is to look for lines, streaks or blotches which appear darker than the surrounding area of the face of the sign. (Note - the head of a stainless steel bolt will appear black when viewed with the spotlight.)

4.6 All signs which do not exhibit uniform appearance when viewed according to this procedure are to be inspected more closely under ambient light (without the spotlight). All signs on which the non-uniformity cannot be attributed to natural causes (i.e., dirt, dew, bird droppings) are to be brought the attention of the Resident Engineer.

4.7 The Resident Engineer may contact the Lansing Maintenance Division for technical advice and to arrange for further field evaluation of non-uniform reflectivity on a sign face.

MICHIGAN
DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAYS

SPECIAL PROVISION
FOR
TRAFFIC SIGNS

Description. Subsections 810.01, 810.02, 810.03C, 810.03E, 810.03M, 912.04A, and 919.02 (first paragraph) of the 1996 Standard Specifications are hereby deleted and replaced with the following.

810.01 Description.-This work consists of furnishing, fabricating, and erecting the traffic control devices specified in accordance with the Michigan Manual of Uniform Traffic Control Devices (MMUTCD).

A. Definitions.-

Alignment.-Orientation of sign face to center of road.

Bolt Hole Wrinkle.-Sheeting wrinkles in the vicinity of a bolt hole.

Bottom Height.-Elevation difference between the bottom edge of sign and the top edge of metal (pavement) or top of curb.

Brightness.-Measure of reflectivity.

Clean Signs.-Signs without foreign material on the surface.

Dark Spot.-An inconsistency in color or reflectivity.

Defect.-Physical imperfection affecting function, performance, or durability of a sign or post. (Dent, Scratch, Nick, Blemish, Mottle, Dark Spot, Scuff, Streak, Warpage, Sheeting Lift).

Dent.-A depression on an even surface.

Embedment.-Depth post is in ground.

Extra Holes.-Holes not used to install the sign.

Fabrication.-Act of producing a product from components.

Field Post Treatment.-Applying preservative material on untreated wood post surfaces in the field.

Font.-Specified letter shape.

Hardware.-Fasteners used to mount signs.

Installation Location.-Location designated for placement of sign.

Layout.-Sign layout design detail in accordance with the Standard Highway Sign Manual or contract provisions.

Level.-In a plane parallel to the horizontal.

Mottle.-Mark with blotches of a different color or shade.

Offset.-The distance from the metal edge of traveled roadway to the object in question.

Patch.-Small piece of reflective sheeting material used to cover a defect or imperfection on a sign surface.

Plumb.-Vertical, 90 degrees to the horizontal plane in all directions.

Post Spacing.-Center to center distance between posts.

Printing Streaks.-Inconsistent color from screening process resulting in a narrow mark/band of color.

Saw Cut.-Partial cut of specified dimensions that creates a plane of weakness in a wood post.

Scratches, Nicks, Blemishes, Scuffs.-Defects in sheeting caused by rubbing, scraping, or improper handling or transport.

Sheeting Lift.-Sheeting that has separated from the substrate.

Sheeting Splice.-Joining of two pieces of sheeting (butt or overlap).

Shim.-Filler material used to plumb steel column sign supports.

Smooth.-A surface free from roughness, bumps, dents, bends, curves, or irregularities.

Splice Indentation.-Impression left from splices in roll sheeting.

Substrate.-Material to which sheeting is applied (wood or aluminum).

Tarring.-Sealing top of wood post sleeves and wedges.

Uniform Reflectivity.-Reflectivity that can be measured to within a given tolerance on entire sign surface area.

Warpage.-Deformation caused by bending or twisting in posts or substrate.

Wedge.-Tapered object used to secure wood posts in sleeves.

Wrinkle.-A furrow or fold in sheeting material.

810.02 Materials.-The materials shall meet the following requirements:

Concrete, Grade P2, P1	601
Concrete, Grade S2	701
Curing Compounds	903
Steel Reinforcement	905
Structural Steel	906
Anchor Bolts and Nuts	908
Electrical Conduit	918
Traffic Control Materials	919

Concrete.-Concrete for cantilever and truss sign support foundation shall be Grade P1 or S2. Concrete for all other sign support foundations shall be Grade P2.

Structural Steel.-When structural steel is specified for either cantilevers or trusses, the structural steel plants shall be certified by the American Institute of Steel Construction for the Category that applies to Highway Sign Structures.

Aluminum Sheet.-Aluminum sheet will be accepted based upon the provisions of Joint Construction and M&T Instructional Memorandum 1997 - B (Interim Procedure for Acceptance of Aluminum Sheet for Permanent Signs) dated January 10, 1997.

810.03C. Steel Post Sign Supports and Square Tubular Steel Sign Supports.-The posts shall be driven or embedded so that the sign face and supports vary from plumb by not more than 5 mm in 1000 mm.

When driving posts, a method shall be used which will not damage the top of the post. When 9 kg/m posts are called for, the hole shall be pre-augured to the diameter specified and backfilled with concrete.

When embedding 9 kg/m posts in concrete sleeves, forms for the concrete will not be required but the Contractor shall prevent the intrusion of earth within the lines and dimensions shown on the plans.

810.03E. Wood Post Sign Supports.-Wood sign support posts shall be erected so that the sign face and supports vary from plumb by not more than 5 mm in 1000 mm.

810.03M. Signs.-All completed signs shall be reasonably free from defects in materials and workmanship at time of installation. Reflectorized sign faces shall be reasonably smooth and free from dents, wrinkles and other defects. They shall exhibit uniform color and brightness over the entire background surface and shall not appear mottled, streaked, or stained when inspected. The sign shall be free of warpage or other deformation. Signs having improper font and/or legend layout shall be subject to adjustment as determined by the Engineer. Signs with unacceptable wrinkles shall be replaced.

Patches will be allowed under the following conditions. A maximum of three patches may be permitted per sign. The patch material shall be of the same material used to fabricate the sign. A maximum of 2% of the signs fabricated per job may contain a patch. For projects with 100 signs or less, the maximum number of signs with patches allowed will be determined by the Engineer. Patches shall extend 15 mm beyond the outer edges of the defect. The maximum patch size will be determined by the Engineer.

The Contractor shall place a date sticker on the back of all signs at the time of installation.

The following **tolerances** shall be allowed in the installation of signs and supports:

Hole Spacing: ± 3 mm from dimensions specified.

Extra Holes: Maximum allowed - two per sign; extra holes shall be patched on both front and back sign surfaces.

Offset: Offset distance shall be within 650 mm of the location shown on the plans or in the standards but no closer to the traveled roadway.

Bottom Height: Rural ± 150 mm
Urban + 150 mm; - 0 mm

Sign Location:

Prior approval of the Engineer must be obtained for location changes for regulatory, gore and no passing zone signs.

± 3 m for advance warning signs. In no case shall the advance warning sign distance be less than the recommended minimum distance set forth in Table 2-1 on page 2C-3 of the MMUTCD or the plans without prior approval of the Engineer.

± 6 m for all other signs.

Post Spacing: Measured horizontally at the ground or base.
Steel Post ± 2%
Wood Post ± 3%

Gaps: Gaps between plywood sheets shall not exceed 2 mm.

Unacceptable Wrinkles: Signs with the following wrinkles shall be replaced:

1. A wrinkle that ends at an outside edge of the sign
2. A wrinkle that exceeds 75 mm in length
3. A wrinkle that has split or the sheeting is damaged

Wedges: The upper dimension for wedges shall be 18 mm to 26 mm.

Signs delivered for use on a project shall be stored as recommended by the reflective sheeting manufacturer. The Contractor shall replace or repair, at the Contractor's expense, any sign that is damaged, discolored, or defaced during fabrication, transportation, storage, or erection. Signs shall be positioned on and fastened to the support. Bolts in contact with reflective sheeting shall be tightened by methods recommended by the reflective sheeting manufacturer. All signs, once erected, shall be clean and free of any substance which would hide or otherwise obscure any portion of the sign face.

Signs erected along a roadway opened to traffic and having a message not immediately applicable, shall have all of the sign message covered until such time as the message is applicable. Signs shall be covered according to Subsection 812.03F2 and Special Provisions.

On any project or section of a project open to traffic where existing signs are being replaced by a new sign or signs, the Contractor shall remove each sign being replaced at the same time that the new sign becomes visible to the motorists. The signs and supports that have been replaced shall be removed from the right of way within seven days and as specified in Subsection 810.03N.

Packaging and protective material used in protecting sign panels shall be completely removed and the Contractor shall perform cleaning of exposed sign face according to manufacturer's specification. If sign construction operations have disturbed the site, leveling and repair may be necessary to ensure the effectiveness and neat appearance of the work. Any excess material shall be removed and disposed of properly. This work shall be done at the Contractor's expense.

912.04 Field Treatment of Preservative Treated Material.-

A. General.-All cuts, saw kerfs, holes, and injuries to the surface of preservative treated material covered by this specification that occur after pressure treatment shall be field-treated. Field treatment shall be done in accordance with all applicable environmental regulations and laws. The Contractor shall take care to ensure that all injuries, such as abrasions and nail and spike holes, are thoroughly saturated with the field-treating solution. Bored holes shall be poured full of preservative. Horizontal holes may be filled by pouring the preservative into the holes with a bent funnel after temporarily plugging the other end of the hole.

919.02 Signs.-Delete the first paragraph of this subsection in the 1996 Standard Specifications and replace it with: "**Traffic control sign materials shall comply with the following:**". All other portions of Subsection 919.02 Signs remain the same.

MICHIGAN
DEPARTMENT OF TRANSPORTATION
BUREAU OF HIGHWAYS

SPECIAL PROVISION FOR TRAFFIC SIGNS

CD:SJE 1 of 6 04-24-97
C:APPR:PAL:EDW 04-24-97

Description. This Special Provision revises and/or replaces the referenced subsections of the 1990 Standard Specifications for Construction.

Subsection 6.26.01 is deleted and replaced by the following:

6.26.01 Description.-This work consists of furnishing, fabricating, and erecting the traffic control devices specified in accordance with the Michigan Manual of Uniform Traffic Control Devices (MMUTCD).

A. Definitions.-

Alignment.-Orientation of sign face to center of road.

Bolt Hole Wrinkle.-Sheeting wrinkles in the vicinity of a bolt hole.

Bottom Height.-Elevation difference between the bottom edge of sign and the top edge of metal (pavement) or top of curb.

Brightness.-Measure of reflectivity.

Clean Signs.-Signs without foreign material on the surface.

Dark Spot.-An inconsistency in color or reflectivity.

Defect.-Physical imperfection affecting function, performance, or durability of a sign or post. (Dent, Scratch, Nick, Blemish, Mottle, Dark Spot, Scuff, Streak, Warpage, Sheeting Lift.)

Dent.-A depression on an even surface.

Embedment.-Depth post is in ground.

Extra Holes.-Holes not used to install the sign.

Fabrication.-Act of producing a product from components.

Field Post Treatment.-Applying preservative material on untreated wood post surfaces in the field.

Font.-Specified letter shape.

Hardware.-Fasteners used to mount signs.

Installation Location.-Location designated for placement of sign.

Layout.-Sign layout design detail in accordance with the Standard Highway Sign Manual or contract provisions.

Level.-In a plane parallel to the horizontal.

Mottle.-Mark with blotches of a different color or shade.

Offset.-The distance from the metal edge of traveled roadway to the object in question.

Patch.-Small piece of reflective sheeting material used to cover a defect or imperfection on a sign surface.

Plumb.-Vertical, 90 degrees to the horizontal plane in all directions.

Post Spacing.-Center to center distance between posts.

Printing Streaks.-Inconsistent color from screening process resulting in a narrow mark/band of color.

Saw Cut.-Partial cut of specified dimensions that creates a plane of weakness in a wood post.

Scratches, Nicks, Blemishes, Scuffs.-Defects in sheeting caused by rubbing, scraping, or improper handling or transport.

Sheeting Lift.-Sheeting that has separated from the substrate.

Sheeting Splice.-Joining of two pieces of sheeting (butt or overlap).

Shim.-Filler material used to plumb steel column sign supports.

Smooth.-A surface free from roughness, bumps, dents, bends, curves, or irregularities.

Splice Indentation.-Impression left from splices in roll sheeting.

Substrate.-Material to which sheeting is applied (wood or aluminum).

Tarring.-Sealing top of wood post sleeves and wedges.

Uniform Reflectivity.-Reflectivity that can be measured to within a given tolerance on entire sign surface area.

Warpage.-Deformation caused by bending or twisting in posts or substrate.

Wedge.-Tapered object used to secure wood posts in sleeves.

Wrinkle.-A furrow or fold in sheeting material.

The following is added to Subsection 6.26.02:

Structural Steel.-When structural steel is specified for either cantilevers or trusses, the structural steel plants shall be certified by the American Institute of Steel Construction for the Category that applies to Highway Sign Structures.

Aluminum Sheet.-Aluminum sheet will be accepted based upon the provisions of Joint Construction and M&T Instructional Memorandum 1997 - B (Interim Procedure for Acceptance of Aluminum Sheet for Permanent Signs) dated January 10, 1997.

Subsection 6.26.05 is deleted and replaced by the following:

6.26.05. Steel Post Sign Supports and Square Tubular Steel Sign Supports.-The posts shall be driven or embedded so that the sign face and supports vary from plumb by not more than 1/4 inch in 48 inches.

When driving posts, a method shall be used which will not damage the top of the post. When 6 lb/ft posts are called for, the hole shall be pre-augured to the diameter specified and backfilled with concrete.

When embedding 6 lb/ft posts in concrete sleeves, forms for the concrete will not be required but the Contractor shall prevent the intrusion of earth within the lines and dimensions shown on the plans.

The first sentence of the second paragraph of Subsection 6.26.06 is deleted and replaced by the following:

Wood sign support posts shall be erected so that the sign face and supports vary from plumb by not more than 1/4 inch in 48 inches.

Subsection 6.26.13 is deleted and replaced by the following:

6.26.13 Signs.- All completed signs shall be reasonably free from defects in materials and workmanship at time of installation. Reflectorized sign faces shall be reasonably smooth and free from dents, wrinkles and other defects. They shall exhibit uniform color and brightness over the entire background surface and shall not appear mottled, streaked, or stained when inspected. The sign shall be free of warpage or other deformation. Signs having improper font and/or legend layout shall be subject to adjustment as determined by the Engineer. Signs with unacceptable wrinkles shall be replaced.

Patches will be allowed under the following conditions. A maximum of three patches may be permitted per sign. The patch material shall be of the same material used to fabricate the sign. A maximum of 2 percent of the signs fabricated per job may contain a patch. For projects with 100 signs or less, the maximum number of signs with patches allowed will be determined by the Engineer. Patches shall extend ½ inch beyond the outer edges of the defect. The maximum patch size will be determined by the Engineer.

The Contractor shall place a date sticker on the back of all signs at the time of installation.

The following **tolerances** shall be allowed in the installation of signs and supports:

Hole Spacing: ± 1/4 inch from dimensions specified.

Extra Holes: Maximum allowed - two per sign; extra holes shall be patched on both front and back sign surfaces.

Offset: Offset distance shall be within two feet of the location shown on the plans or in the standards but no closer to the traveled roadway.

Bottom Height:	Rural	± 6 inches
	Urban	+ 6 inches; - 0 inches

Sign Location:

Prior approval of the Engineer must be obtained for location changes for regulatory, gore and no passing zone signs.

± 10 feet for advance warning signs. In no case shall the advance warning sign distance be less than the recommended minimum distance set forth in Table 2-1 on page 2C-3 of the MMUTCD or the plans without prior approval of the Engineer.

± 20 feet for all other signs.

Post Spacing: Measured horizontally at the ground or base.

Steel Post ± 2%
Wood Post ± 3%

Gaps: Gaps between plywood sheets shall not exceed 3/32 inch.

Unacceptable Wrinkles: Signs with the following wrinkles shall be replaced:

1. A wrinkle that ends at an outside edge of the sign
2. A wrinkle that exceeds 3 inches in length
3. A wrinkle that has split or the sheeting is damaged

Wedges: The upper dimension for wedges shall be 3/4 inch to 1 inch.

Signs delivered for use on a project shall be stored as recommended by the reflective sheeting manufacturer. The Contractor shall replace or repair, at the Contractor's expense, any sign that is damaged, discolored, or defaced during fabrication, transportation, storage, or erection. Signs shall be positioned on and fastened to the support. Bolts in contact with reflective sheeting shall be tightened by methods recommended by the reflective sheeting manufacturer. All signs, once erected, shall be clean and free of any substance which would hide or otherwise obscure any portion of the sign face.

Signs erected along a roadway opened to traffic and having a message not immediately applicable, shall have all of the sign message covered until such time as the message is applicable. Signs shall be covered according to Subsection 6.31.05 and Special Provisions.

On any project or section of a project open to traffic where existing signs are being replaced by a new sign or signs, the Contractor shall remove each sign being replaced at the same time that the new sign becomes visible to the motorists. The signs and supports that have been replaced shall be removed from the right of way within seven days and as specified in Subsection 6.26.14.

Packaging and protective material used in protecting sign panels shall be completely removed and the Contractor shall perform cleaning of exposed sign face according to manufacturer's specification. If sign construction operations have disturbed the site, leveling and repair may be necessary to ensure the effectiveness and neat appearance of the work. Any excess material shall be removed and disposed of properly. This work shall be done at the Contractor's expense.

Subsection 8.26.05(u) is deleted and replaced by the following:

8.26.05 u. - Field Treatment of Preservative Treated Material.-

A. General.-All cuts, saw kerfs, holes, and injuries to the surface of preservative treated material covered by this specification that occur after pressure treatment shall be field-treated. Field treatment shall be done in accordance with all applicable environmental regulations and laws. The Contractor shall take care to ensure that all injuries, such as abrasions and nail and spike holes, are thoroughly saturated with the field-treating solution. Bored holes shall be poured full of preservative. Horizontal holes may be filled by pouring the preservative into the holes with a bent funnel after temporarily plugging the other end of the hole.

B. Preservative.-The solution used for field treatment shall be a 20 percent solution of copper naphthenate, based on copper as metal, meeting the requirements of AWPA Standard P8. The copper naphthenate shall be applied by a State of Michigan Certified Commercial Pesticide Applicator.

Delete the first paragraph of this subsection in the 1990 Standard Specifications and replace it with the introductory statement below. All other portions of Subsection 8.26.02 Signs remain the same.

8.26.02 Signs. - Traffic control sign materials shall comply with the following: